No.10

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Address: To Patent Office Examiner Takehiko Tooyama
Identification of the Case
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Contents of Argument
Reasons:

(1) About Reason 2

1. The Examiner cited the following publications to demonstrate that the invention of the present application could be easily made based on the inventions disclosed by these publications by a person skilled in the art and concluded that it is unpatentable in accordance with Paragraph 2 of Article 29 of the Patent Law:

Reference 1: Japanese Unexamined Patent Publication No.083899/1982
Reference 2: Japanese Unexamined Patent Publication No. 022925/1992

2. As a result of careful examination of the above publications, the applicant decides to make an amendment to the specification in the form of a written amendment which the applicant files along with this argument. This amendment clarifies the features of the present invention.
The amendment includes a modification which further limits the invention claimed in Claim 1 and additional claims dependent on Claim 1, Claim 2 and Claim 3.
If you accept this amendment, we think that clearly the amended inventions cannot be made easily based on the inventions disclosed in the above publications. We hope you will examine them and make a decision to acknowledge their patentability.

3. The invention claimed in the new Claim 1 is as follows:
"An optical repeater used in an optical transmission system which multiplexes an

optical data signal and an optical supervisory signal and transmits them through an optical transmission line, comprising:

a demultiplexer which demultiplexes said optical data signal and said first optical supervisory signal which have been received from said optical transmission line and multiplexed;

an exciting light source which outputs exciting light used to amplify said optical data signal;

a first multiplexer which multiplexes said exciting light and said demultiplexed optical data signal;

an optical fiber which receives said optical data signal multiplexed with said exciting light and outputs said amplified optical data signal;

an optical receiver which receives said first optical supervisory signal from said demultiplexer and converts it into a first electric supervisory signal;

a controller which receives said first electric supervisory signal and makes a second electric supervisory signal by adding information on a fault in said optical transmission line to said first electric supervisory signal and outputs it;

an optical transmitter which receives said second electric supervisory signal and converts said second electric supervisory signal into a second optical supervisory signal; and

a second multiplexer which multiplexes said amplified optical data signal with said second optical supervisory signal outputted from said optical transmitter,

wherein the wavelength of said first optical supervisory signal or said second optical supervisory signal is approximately 1.48 μm."

This constitution allows monitoring of an optical transmission line including optical repeaters and transfer of an optical supervisory signal without an output power drop during amplification of an optical data signal by an optical amplifier.

4. The invention described in Reference 1 concerns a technique that a main signal is regenerated/repeated or simply passed and a supervisory signal is regenerated/repeated after its frequency is varied from station to station. The invention described in Reference 2 concerns a technique that exciting light is modulated and thus also used as supervisory light.

5. On the other hand, as clearly indicated by the amended or new Claim 1, the received optical data signal and optical supervisory signal are first divided

(demultiplexed) and then the demultiplexed optical data signal is optically amplified so that the gain of the optical data signal cannot decrease. After that, the optical data signal multiplexed with exciting light is amplified by an optical amplifier and then the amplified optical data signal is multiplexed with the optical supervisory signal and sent to an optical transmission line. Here, the wavelength of the optical supervisory signal is out of the amplification range of the optical amplifier and such a wavelength that transmission loss of the optical supervisory signal in the optical transmission line is virtually the same as transmission loss of the optical data signal.

6. According to the Examiner, the technique that an amplified optical data signal is multiplexed (coupled) with an optical supervisory signal is described in Reference 1, and it is easy for a person skilled in the art to think of using an optical amplification technique for amplifying an optical data signal if the invention described in Reference 2 is adopted.

An object of the invention described in Reference 1 is to facilitate identification of the location of a fault between terminals. In this invention, an optical supervisory signal whose wavelength varies with the repeater between terminals is superimposed on a main signal and each supervisory signal is wavelength-divided and converted into an electric signal at the receiving end to measure the level of each signal. In other words, the purpose of multiplexing and demultiplexing a main signal and an optical supervisory signal in each repeater is to superimpose a fault search current on an optical supervisory signal.

By contrast, the invention claimed in Claim 1 offers a solution to a problem which might result from "optically amplifying" (which is not included in Reference 1). The problem refers to a phenomenon that when an optical data signal is optically amplified together with an optical supervisory signal, the gain of the optical data signal decreases, resulting in a drop in the optical data signal output power. In order to solve the problem, the present invention proposes an approach that before an optical data signal is optically amplified, the optical data signal and optical supervisory signal are divided by a demultiplexer and then after the optical data signal is amplified by an optical fiber, it is multiplexed with the optical supervisory signal.

In the invention described in Reference 2, exciting light with a wavelength of approximately 1.48 μm is also used as an optical supervisory signal, and both the main signal and the exciting light/supervisory signal are optically amplified before

being sent to an optical transmission line. In the invention described in Reference 2, exciting light also serves as supervisory light, so this is conceptually different from the invention claimed in Claim 1 in which exciting light and supervisory light are separately outputted. In the invention described in Reference 2, both a main signal and an optical supervisory signal are optically amplified, which would pose the problem that the present invention is intended to solve.
On the other hand, in the invention claimed in Claim 1, an optical supervisory signal and exciting light are separate from each other; the optical data signal and exciting light enter an optical amplifier where the optical data signal is amplified; and the amplified optical data signal is multiplexed with the optical supervisory signal. In addition, the wavelength of the optical supervisory signal is approximately 1.48 μm. This is meant to produce particular effects of preventing a reduction in the gain of the optical data signal due to the optical amplifier and also a decrease in the optical signal transmission distance, by using an optical supervisory signal whose wavelength (1.48 μm) is out of the amplification range of the optical amplifier and such a wavelength that transmission loss of the optical supervisory signal in the optical transmission line is virtually the same as transmission loss of the optical data signal.

7. As mentioned above, the invention claimed in Claim 1 has a constitution and effects which are not suggested by the cited references. Therefore, we consider that even a person skilled in the art cannot easily think of making the invention claimed in Claim 1 based on the inventions described in References 1 and 2.

8. The newly added Claim 2 and Claim 3 are dependent on Claim 1 and specify the method of making a decision on a fault. We consider that because the invention claimed in Claim 1 meets patentability requirements, the inventions claimed in Claim 2 and Claim 3 are patentable like the invention claimed in Claim 1.

9. As we have explained above, we believe that the inventions of the present application apparently have constitutions and effects which are not suggested by the cited references. We cordially ask you to examine them and make a decision to acknowledge their patentability.

(2) About reason 1

10. Regarding the invention claimed in Claim 1, the Examiner points out that the expression "processing" does not show what kind of processing is done and concludes that the claim does not comply with Paragraph 5·2 and Paragraph 6 of Article 36 of the Patent Law.

11. In the amended Claim 1, the expression "processing" is converted into the expression "makes a second electric supervisory signal by adding information on a fault in said optical transmission line to said first electric supervisory signal" to make the meaning clearer. In other words, Claim 1 is amended so that "processing" in the original Claim 1 means a process in which information on a fault in the optical transmission line which the optical repeater has found is added to the optical supervisory information sent from the optical transmitter or the preceding optical repeater to make a new optical supervisory signal and this new signal is sent to a subsequent optical repeater or optical receiver.

12. The applicant amends the claims in the form of a written amendment which the applicant files along with this argument to make the clarification as mentioned above.

13. As we have explained above, we believe that the inventions of the present application apparently have constitutions and effects which are not suggested by the cited references. We consider that the amended claims only contain the features indispensable for the constitution of an invention to be patented. So, we cordially ask you to examine them and make a decision to acknowledge their patentability.

[Necessity for proof] Needed